UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/987,718	11/15/2001	Kazuyuki Nitta	2001-1703A	7678

513 7590 03/21/2003

WENDEROTH, LIND & PONACK, L.L.P.
2033 K STREET N. W.
SUITE 800
WASHINGTON, DC 20006-1021

EXAMINER	
SAGAR, KRIPA	
ART UNIT	PAPER NUMBER
1756	

DATE MAILED: 03/21/2003

4

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/987,718	Applicant(s) NITTA ET AL.	
	Examin r Kripa Sagar	Art Unit 1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 November 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *5-20* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-20* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *3* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1-4, drawn to a hole-patterning method, classified in class 430, subclass 313.

   II. Claims 5-20, drawn to a resist composition, classified in class 430, subclass 270.1.

2. Inventions II and I are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product (MPEP § 806.05(h)). In the instant case the product as claimed can be used in a materially different process such as a lift-off process.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with attorney Matthew Jacob on 2/25/03 a provisional election was made with traverse to prosecute the invention of hole patterning method, claims 1-4. Affirmation of this election must be made by applicant in replying to this Office action. Claims 5-20 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Double Patenting

5. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

6. Claim 1 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 11 of copending Application No. 09928430 in view of US Pat. 6284438 to Choi et al. The instant claim differs from claim 11 of the copending application in that Claim 11 does not recite a hole-pattern and a half-tone mask . Choi teaches forming a hole-pattern using a half-tone mask and thermal-reflow of the pattern to reduce the hole dimension (3;14-64)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the compositions and methods of claim 11 and form hole patterns with a half-tone mask, as taught by Choi because Choi teaches that thermal reflow provides pattern dimensions below the resolution limit of the apparatus (2;16-25).

This is a provisional obviousness-type double patenting rejection.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Pat.US. Pat. 6284438 to Choi et al. in view of US Pat.6072006 to Bantu et al.

The instant claims recite a method of patterning holes in a photoresist and thermally reflowing the pattern. The resist composition is specified.

Choi teaches a resist composition that is suitable for thermal reflow and a method of forming a hole pattern using a half-tone phase shift mask. The resist comprises a polymer that is acid labile making it more soluble in an alkaline solution, a photo-acid generator (PAG) and a basic amine. Choi teaches the steps of patterning a hole-pattern using a half-tone mask (HTM). The hole dimensions are reduced by thermal-flow. (3;33-4;25). The reflow times and temperatures are similar to the instant claims (examples 6,7,8, cols. 14-15). The base polymer constitutes nearly 50- 90% (w/w) of the resist (3;65-4;9). The PAG (1-15% w/w) and amine (0.1-2% w/w) are within the range of the instant claims (4;18-26).

Choi does not teach a cross-linking agent comprising a divinyl ether group (cl.1,3,4).

Bantu teaches that polyvinyl ethers form excellent cross-linking compounds, in a chemically amplified resist (CAR) containing polyhydroxystyrene base-polymers. (7;38-42). A preferred polyvinyl ether is cyclohexanedimethanol divinyl ether (CHDVE; 4;61).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a cross-linking compound as taught by Bantu with Choi's composition to form thermally reflowable resists because Bantu teaches that the degree of cross-linking and hence the thermal flow of the resist can be controlled by the type and amount of polyvinylether used (2;64-3;37).

9. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over US. Pat. 6511785 to Takemura et al. in view of US Pat.6072006 to Bantu et al. and further in view of US Pat. 6284438 to Choi et al.

The instant claims recite a method of patterning holes in a photoresist and thermally reflowing the pattern. The resist composition is specified.

Takemura teaches a chemically amplified resist suited to thermal reflow and for forming hole patterns. The components of the resist include a base polymeric resin, a photoacid generator (PAG), a basic amine and a cross-linking agent comprising a divinyl group (5;1-9). The compositions indicated in the tables 1, 2 include the range of the instant claims (44;54 – 45;45). Takemura teaches the method of forming hole patterns and reflowing the resist. The thermal regime is within the range of the instant claims (42;56-43;26).

Takemura does not explicitly name the use of CHDVE as a cross-linking agent; it teaches the use of divinyl ethers such as 1,4 butanediol divinyl ether (44;18). It does not teach the use of HTM for patterning the holes.

Bantu teaches that polyvinyl ethers form excellent cross-linking compounds, in a chemically amplified resist (CAR) containing polyhydroxystyrene base-polymers. (7;38-42). A preferred polyvinyl ether is cyclohexanedimethanol divinyl ether (CHDVE; 4;61).

Choi teaches the use of half-tone masks for forming hole patterns. (10;45-49).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Bantu's CHDVE for butanediol-DVE in Takemura's composition and to use a half-tone mask as taught by Choi to pattern Takemura's hole-patterns because Bantu teaches that they are isomorphous (4;61-62) and Choi teaches that it is conventional to use HTMs and that there is a reasonable expectation of successfully forming hole patterns for thermal-reflow using an HTM.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kripa Sagar whose telephone number is 703-605-4427. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on 703-308-2464. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

MH/ks
March 17, 2003

MARK F. HUFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700